

REMARKS:

Claims 1-30 are pending.

Amendment is made to eliminate all multiple dependencies from the claims, thereby avoiding the need to pay the multiple dependent surcharge.

Also attached on a separate page is and Abstract of the Disclosure.

Respectfully submitted,


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MARKED-UP VERSION OF THE CHANGES TO THE CLAIMS

3. (amended) Process according to [claim 1 or 2] claim 1, characterized in that also the temperature of the main processing step is kept below the plasticizing temperature of the PET-material.

4. (amended) Process according to [any of claims 1 to 3] claim 1, characterized in that for PET-pieces and/or milled PET-bottles the pre-processing step, that preferably is performed under environmental pressure, is performed at a temperature range of 140 to 190°C, preferably 150 to 160°C, and at simultaneous mechanic treatment or, respectively, applying power that causes heating, by means of at least one mixing and/or comminuting element, wherein the average dwell-time of the PET-material or, respectively, the duration of pre-processing, amounts to 35 to 65 min, preferably 40 to 60 min.

5. (amended) Process according to [any of claims 1 to 3] claim 1, characterized in that for PET -foils and/or PET-fibers and/or PET-flakes, the pre-processing step, that preferably is performed under environmental pressure, is performed at a temperature range of 170 to 200°C, preferably 180 to 200°C, and at simultaneous mechanic treatment or, respectively, power applying that causes heating, by at least one mixing and/or comminuting element, wherein the average dwell-time of the PET-material or, respectively, the duration of pre-processing, amounts to 10 to 30 min, preferably 10 to 15 min.

6. (amended) Process according to [any of claims 1 to 5] claim 1, characterized in that the PET-material is subjected to the pre-processing step in a continuous flow.

7. (amended) Process according to [any of claims 1 to 6] claim 1, characterized in that the pre-processed PET-material is subjected to an intermediate storage between the pre-processing step and the main-processing step, the duration of this storage corresponds to 80 to 120 % of the duration of pre-processing step, and that the pre-processed PET-material is kept during the intermediate storage and/or during conveying to main-

processing at a temperature that is as constant as possible, in particular 130 to 190°C, preferably 150 to 170°C.

8. (amended) Process according to [any of claims 1 to 7] claim 1, characterized in that during the main-processing step that is performed under vacuum, in particular under a pressure of less than 20 mbar, preferably less than 10 mbar, the pre-processed PET-pieces and/or the milled bottle material is mechanically treated at a temperature of 170 to 210°C, preferably 180 to 200°C, or is subjected to a power introduction that causes heating by at least one, preferably rotating, mixing and/or comminuting element, wherein the average dwell-time of the PET-material or the duration of the main-processing step, respectively, amounts to 40 to 100 min, preferably 50 to 90 min.

10. (amended) Process according to [any of claims 1 to 7] claim 1, characterized in that at the main-processing step that is performed under vacuum, the pre-processed PET-foils and/or PET-fibers are processed at a temperature of 160 to 210°C, preferably 170 to 205°C, or, respectively, are subjected to a mechanic power introduction that causes heating by at least one mixing and/or comminuting element, wherein the average dwell-time of the PET-material or the duration of the main-processing step, respectively, amounts to 5 to 25 min, in particular to 10 to 15 min.

12. (amended) Process according to [any of claims 5 to 11] claim 5, characterized in that at least one rotating mixing and/or comminuting element is used.

13. (amended) Process according to [any of claims 1 to 12] claim 1, characterized in that the PET-material is comminuted before pre-processing to sizes of 15 to 25 mm.

14. (amended) Process according to [any of claims 1 to 13] claim 1, characterized in that the PET-material to be processed is pre-communited and/or washed and/or pre-dried before the pre-processing step.

15. (amended) Process according to [any of claims 1 to 14] claim 1, characterized in that the PET-material is supplied from a main-processing apparatus (4) to the

extruder (8) under vacuum conditions or, respectively, that the vacuum existing within the main-processing apparatus (4) acts into the inlet section of the extruder (8).

16. (amended) Apparatus for recycling of PET-material, in which the PET-material to be processed is dried, crystallized and plasticized or, respectively, molten, and the melt, if desired after filtering, is processed to PET-granulate, for performing the process according to [any of claims 1 to 9] claim 1, characterized by two processing steps, in the first of which there is provided for pre-processing of the supplied PET-material a pre-processing device (3) having mechanical processing elements (5) for drying and simultaneously crystallizing the PET-material at elevated temperature and that this first step is followed by a second processing step comprising an evacuable main-processing device (4) having mechanical processing elements (5') for further drying, crystallizing and temperature increase of the PET-material supplied by the pre-processing device (3).

18. (amended) Apparatus according to [claim 16 or 17] claim 16, characterized in that as well within the pre-processing device (3) as within the main-processing device (4) there is provided at least one rotating mixing and/or comminuting element (5, 5') which mechanically treats and heats the PET-material.

21. (amended) Apparatus according to [any of claims 16 to 20] claim 16, characterized in that an intermediate storage means (6) is inserted between the pre-processing device (3) and the main-processing device (4), the volume of this storage means (6) corresponds to 100 to 200 % of the volume of the pre-processing device (3).

22. (amended) Apparatus according to [any of claims 6 to 21] claim 6, characterized in that between the pre-processing device (3) and the intermediate storage means (6) and between the intermediate storage means (6) and the main-processing device (4) a thermically isolated and/or heated conveyor unit (7) each is provided, preferably a conveyor screw or an extruder.

23. (amended) Apparatus according to [any of claims 16 to 22] claim 16, characterized in that the volume of the main-processing device (4) amounts to 80 to 200% of the volume of the pre-processing device (3), in particular to 100 to 180 %.

24. (amended) Apparatus according to [any of claims 16 to 23] claim 16, characterized in that an extruder (8) is connected to the main-processing device (4), in which extruder the PET-material taken from the main-processing device (4) is heated to a temperature of 260 to 275°C and is plasticized or molten, respectively.

26. (amended) Apparatus according to [claim 24 or 25] claim 24, characterized in that the extruder (8) comprises at least one de-gassing zone (9) to which a vacuum pump (10) is connected by which within the de-gassing zone (9) a pressure of less than 40 mbar, in particular less than 10 mbar, can be adjusted.

27. (amended) Apparatus according to [any of claims 16 to 25] claim 16, characterized in that a filtration device (11) for PET-melt is connected to the extruder (8) and that, if desired, a device (12) for producing finished products or semi-finished products, for example PET-granulate, is connected to this filtration device (11).

29. (amended) Apparatus according to [any of claims 16 to 28] claim 16, characterized in that the pressure in the main-processing device (4) is adjustable to less than 150 mbar, preferably less than 20 mbar.

30. (amended) Apparatus according to [any of claims 16 to 29] claim 16, characterized in that an additional heating for the pre-processing device (3) and/or for the main processing device (4) is provided.

METHOD AND DEVICE FOR RECYCLING PET MATERIALS

ABSTRACT OF THE DISCLOSURE

According to the inventive method for recycling PET materials and/or items consisting of PET, the PET material to be treated is heated in a pretreatment process, dried and at the same time crystallized at a high temperature. This pretreatment is followed by a main treatment in a vacuum. Said main treatment consists of re-drying a material that has been treated and re-crystallizing said material at a higher temperature than that used for the pretreatment. The material is preferably not softened or melted during the main treatment - the softening or melting does not take place until after the main treatment step. A device for carrying out this method has a pretreatment unit (3) in which the material to be treated is dried at a high temperature, crystallized at the same time and, optionally, also reduced. A main treatment device (4) in which the PET material supplied is dried, crystallized and heated to a higher temperature than that used in the pretreatment unit is connected to said pretreatment unit (3).

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